
D. Recreational Angling Benefits of Improved Quality on Kalamazoo River, Michigan

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This report summarizes a simulation of the effects of an increase in river quality for 74.05 miles of river in Kalamazoo and Allegan Counties, Michigan. The simulation is based on the Michigan Recreational Angling Demand Model, a large-scale application of the economic technique referred to as the travel cost method. The model was developed at Michigan State University with funding by the Michigan Department of Environmental Quality and Michigan Department of Natural Resources, as reported in Hoehn *et al* and Lupi *et al*. For brevity, I refer to the model as the "MSU model."

The MSU model is a type of travel cost model referred to as a repeated random utility model (RUM). RUMs use data on individual trips and statistical techniques to explain anglers' fishing site choices and relate these choices to the costs and characteristics of alternative fishing sites. It is through this linkage that RUMs can be used to value changes in site characteristics such as river quality. Since possible fishing destinations differ in their travel costs and characteristics, anglers must make a trade-offs between travel costs and site characteristics. The RUM approach assumes that anglers pick the site that they consider to be best. Anglers' choices reveal their relative preferences for site characteristics and travel costs, i.e., the anglers' willingness to trade costs (or money) for site characteristics. As a repeated RUM, the MSU model estimates seasonal participation as well as site choices.

The MSU model uses data describing where and how often anglers go fishing in Michigan that was collected in an extensive telephone panel survey that followed over 2,000 anglers during the course of the 1994-95 fishing year. The panel members were recruited from the general population of Michigan residents and interviewed using computer assisted telephone interviewing. The structure of the MSU model reflects the broad array of fishing opportunities available to the state's anglers. In the MSU repeated RUM, trips are differentiated by trip durations (single versus multiple day trips), by water body fished at (Great Lakes, inland lakes, rivers/streams), and by species targeted ("warm" species such as bass, perch and walleye, versus cold species such as salmon and trout). Thus, for both single and multiple day trip types, seven distinct fishing activities are separately classified in the MSU model: Great Lakes warm, Great Lakes cold, inland lake warm, inland lake cold, river and stream warm, river and stream cold, and river anadromous runs. For inland lake warm and cold fishing sites, destination sites are

defined at the county level. For Great Lakes warm and Great Lakes cold fishing types, destination sites are defined by the stretch of Great Lake shoreline within a county.

For river and stream fishing, fishing destinations are distinguished according to the three types of species that can be targeted on a fishing trip: warm species, non-anadromous cold species, and anadromous species. Anadromous run refers to Great Lakes trout and salmon on migratory runs up or down-stream. These species types constitute the three river and stream fishery types that enter the model. Destinations within the river and stream fishery types are defined as the counties in Michigan which contain river fishing opportunities for that species type. In the MSU model, fishing trips of the “river and stream warm” type are related to the number of miles of river within a county that are classified as top and as secondary quality. This variable and trip type will be affected by the simulations discussed below. Rivers miles classified as “top quality” support good self-sustaining stocks of desirable game fish. “Secondary quality” river miles contain populations of game fish, but game fish populations are appreciably limited by such factors as pollution, competition, or inadequate natural production.

In a repeated RUM such as the MSU model, the season is divided into a series of choice occasions. In each occasion, anglers decide whether to take a trip, and if so, where to fish. In all, the Michigan model contains over 850 distinct fishing opportunities in each choice occasion, and this set of opportunities is available for over 60 occasions for each sampled angler in the model. Moreover, the model contains about 80 parameters that were statistically estimated. While the entire statistical model is used in the simulations discussed below, it is worth noting that the key parameters in the simulation (travel costs and the river quality classifications) are all significantly different from zero at $p > 0.011$ or higher.

Model Simulation

This section describes the policy simulation examined using the MSU model. In the river and stream warm-water fishing trip type, river quality improvements were simulated by changing the stream quality variables from second quality to top quality for 74.05 miles of the Kalamazoo River. Specifically,

- In the river and stream warm-water fishing trip type, 58.47 miles of river in Allegan County were changed from second quality to top quality.
- In the river and stream warm-water fishing trip type, 15.58 miles of river in Kalamazoo County were changed from second quality to top quality.
- No changes were made at any other counties.
- No changes were made in any of the six other fishing trip types (i.e., no changes in Great Lakes warm, Great Lakes cold, inland lakes warm, inland lakes cold, river/stream cold, or anadromous run).

Estimated total statewide use value to resident anglers for the April to October season for the specified warm river miles changing from second to top quality as estimated by the model simulation run is \$368,351 per year in 1994 dollars. The U.S. Bureau of Labor Statistics' CPI calculator (<http://www.bls.gov/cpi>) yields a conversion factor of 1.2 to convert 1994 dollars into 2001 dollars. Thus, in 2001 dollars, the estimated value from the MSU model is \$442,021.

Estimated trip changes: For the simulated change in warm-water river quality, the model predicts that the river and stream warm-water fishing in Allegan and Kalamazoo Counties increases by 50.9% for fishing trips and by 61.8% for user days. Table 1 presents these results as well as some more detailed information. The largest percentage increases are seen in Allegan County which includes Lake Allegan and which has 58.47 of the 74.05 warm-river miles that improve under the simulation scenario.

Table 1. MSU Model estimates of changes in river and stream warm-water fishing trips at Allegan and Kalamazoo Counties for the simulated increase in river quality.

	County	Change in river-warm trips
Single Day, River-Warm, Trips	Allegan	67.9%
	Kalamazoo	13.6%
Multiple Day, River-Warm, Trips	Allegan	142.7%
	Kalamazoo	26.4%
River-Warm User Days*	Allegan	90.9%
	Kalamazoo	16.9%
Total River-Warm Trips	Allegan and Kalamazoo	50.9%
Total River-Warm User Days*	Allegan and Kalamazoo	61.8%

* User days calculated by multiplying multiple day trips by 3.85, the average length of multiple day trip, and adding single day trips.

Scope of results:

The estimates reported in this report are for the anglers and season represented in the MSU model. The following points highlight some fishing trips and people that may have benefits that are outside the scope of the model:

- Model results apply to the period of April 1 through October 31. Thus, any trips outside this season are not included in the estimated annual values from the MSU model.
- Model results only apply to trips where the purpose was primarily for fishing.
- Model results do not apply to any fishing trips by non-residents of Michigan.
- Model results do not include anglers below the age of 18.
- The model can only estimate use-values associated with recreational angling.

Sources of uncertainty for simulation results:

There are many possible sources of uncertainty associated with using the MSU model to estimate natural resource damages at the Kalamazoo River. For one, the degree to which the simulated change in river quality reflects the damages at the Kalamazoo River affects the results. Simulated changes reported here only affect the river and stream warm fishing trip types – all other trip types that may experience a change in quality are not captured by these estimates. Another factor that may be a source of uncertainty is that the sites are defined at the county level and may not correspond perfectly with the affected river areas. In any such travel cost model, valuation results for specific sites are affected by the degree to which the model fits those sites – the estimated model may over or under-estimate actual warm-river fishing trips to the affected counties which will have a similar effect on the estimated values. A related issue is that the MSU model is based on fishing behavior from 1994 and current and future behavior patterns may shift. As is true with any travel cost model, variations in the measurement of travel cost and other variables will affect the estimated trip and value predictions.

References:

- Hoehn, John P., Theodore Tomasi, Frank Lupi, and Heng Z. Chen, *An Economic Model for Valuing Recreational Angling Resources in Michigan*, Report submitted to the Michigan Department of Environmental Quality and Michigan Department of Natural Resources, Department of Agricultural Economics, Michigan State University, December 1996.
- Lupi, Frank, John P. Hoehn, Heng Z. Chen and Theodore Tomasi, "The Michigan Recreational Angling Demand Model," *Agricultural Economics Staff Paper* 97-58, Department of Agricultural Economics, Michigan State University, January, 1998.